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Investigation on biological action of Small-flowered Willowherb

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Small-flowered Willowherb (*Epilobium parviflorum* Schreb.) is traditionally used in the prevention and complementary treatment of benign prostatic hyperplasia (BPH). BPH is maintained by complex and still not entirely discovered pathological factors, but age-related hormone imbalance, decreased apoptosis, inflammation and excessive oxidative stress are definitely involved in the patomechamnism. Based on our analysis, willowherb is rich in various structured phenoloids. Its most characteristic compounds are myricetin-, quercetin- and kaempferol-glycosides, as well as the often macrocyclic derivatives of ellagic- and gallic acid (e.g.: oenothein B). Apolar extract of willowherb contains β-sitosterol.

Our workgroup aimed to investigate the mechanism of action of *Epilobium parviflorum* with special regard to its antioxidant activity and anti-inflammatory effect.

H-donor capacity of willowherb was measured by two different spectrophotometric methods (ABTS, DPPH). Inhibitory action on lipidperoxidation was examined with TBA assay, on bovine brain liposomes. Antioxidant cell-protective effect of *Epilobium* was studied on fibroblast cells. Anti-inflammatory effect was investigated on macrophage cells, by examination of COX-enzyme inhibitory action of extract.

Willowherb showed a remarkable H-donor activity (EC_{50}: ABTS 1.71 ± 0.05μg/ml; DPPH 3.01 ± 0.03 μg/ml), comparable to that of ascorbic acid and trolox. In the TBA assay willowherb extract showed concentration-dependent inhibition of lipid peroxidation at doses over 0.20mg/mL (IC_{50}=2.37 ± 0.12mg/mL). *Epilobium* extract exerted steady and concentration-dependent protective effect against oxidative damage generated on fibroblast cells. The protective action was comparable to that of catalase enzyme (250IU/ml). *Epilobium* extract showed concentration-dependent COX-enzyme inhibitory action (IC_{50}=1.4±0.1μg/ml).

Biological action of *Epilobium parviflorum* has been *in vitro* investigated. Based on our results, willowherb possessed high H-donor capacity and antioxidant cell-protective effect. The extract inhibited lipidperoxidation and the activity of COX-enzyme. These results suggest that extract of *Epilobium parviflorum* has antioxidant and anti-inflammatory properties which are likely to contribute to its beneficial effect in BPH. However, for wider, evidence-based application of willowherb further in vitro and in vivo studies are necessary.

Pigment photosensitized reactions make dark-grown pea epicotyls wilt in the light – direct detection of ROS promoting type-I and type-II photochemistry

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Upon illumination, epicotyls of dark grown pea (*Pisum sativum* L.) seedlings loose turgor in their middle section and wilt. Direct detection of singlet oxygen shows the involvement of type-II photoreactions, while co-localization of hydrogen peroxide and protochlorophyllide monomers suggests the contribution of type-I photodynamic pigment reactions as well. Hydroxyl radicals were detectable with spin trapping electron paramagnetic resonance spectroscopy and were also triggered by adding hydrogen peroxide in the dark, demonstrating Fenton chemistry.

In plants, native arrangements of pigment-protein complexes are critical during early plant development. In most angiosperms, various chlorophyllous pigments are safely stored in aggregates (macrodomains), such prolamellar bodies of leaf etioplasts, to prevent photo-oxidation. However, etioplasts in epicotyls or other stem related organs contain only few and small macrodomains and the chlorophyll precursor pigments, such as protochlorophyllide (Pchlide) are predominantly in monomer state in them.